

Infectious diseases of the skin- bacterial, viral infections

Dr. Márta Marschalkó

- I. Cutaneous resistance to microbial agents
- II. Bacterial infections
- III. Viral infections

- I. Cutaneous resistance to microbial agents:
- Physicochemical characteristics
- Epidermal integrity
- Skin normal flora
- Innate immunity
- Adaptive immunity

- I.
- II. Bacterial infections:
- Staphylococcus aureus, Streptococcus pyogenes:
- impetigo, folliculitis, furuncle, erysipel, cellulitis, fasciitis necrotisans, SSSS, toxic shock syndrome

- II. Bacterial infections:
- Mycobacterium tbc, Atypical mycobacterium infections, Actinomyces israeli, Borrelia burgdorferi

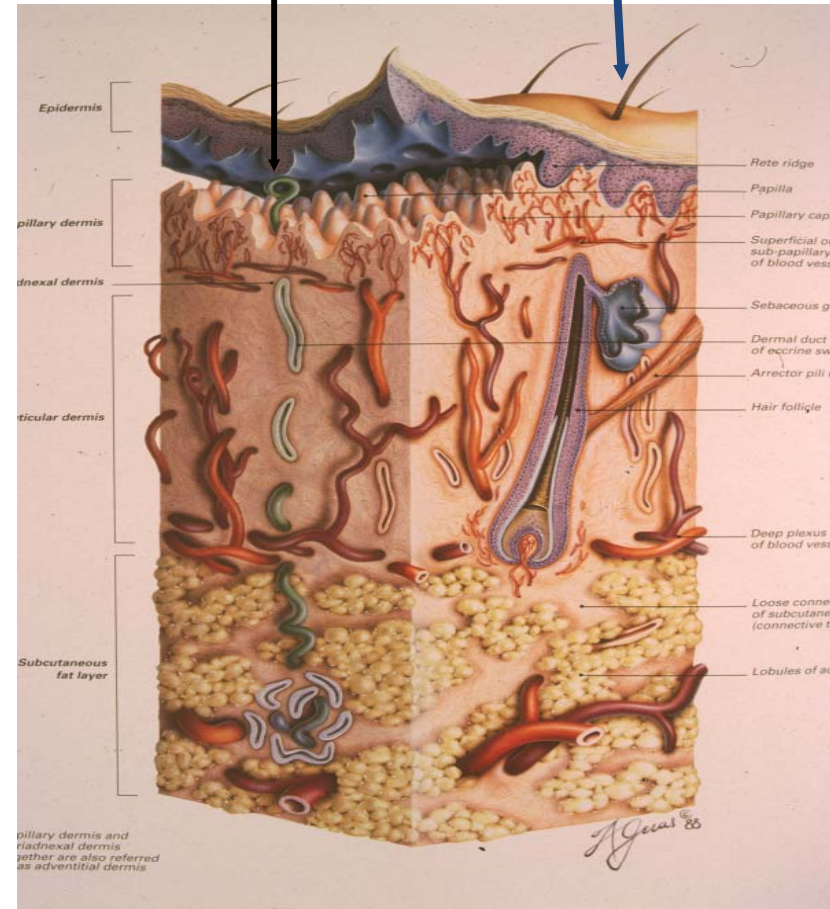
- III. Viral infections: HPV, herpes family, molluscum contagiosum

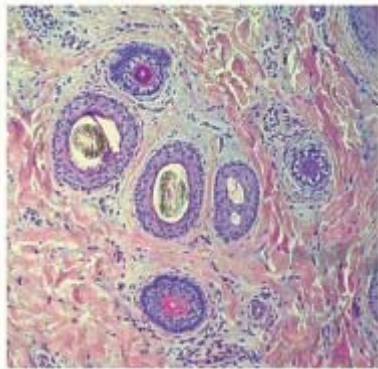
FUNCTIONS OF SKIN

- **protects against mechanical injury**
- **prevents entry of microorganisms and chemicals**
- **screens and reduces penetration of radiation**
- **SIS**
- **thermoregulation**
- **sensory nervous function**
- **synthesis of D vitamin**

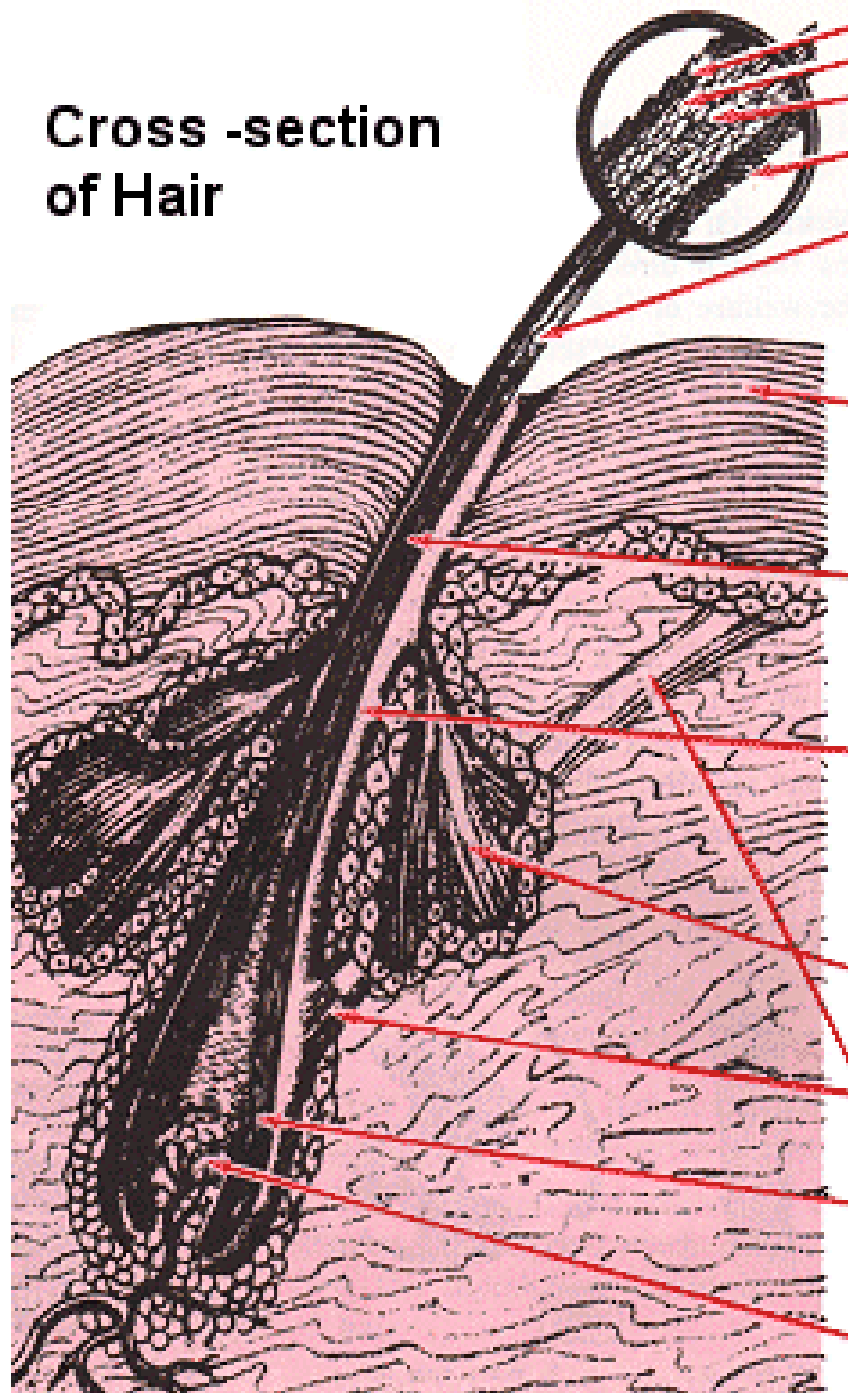
Entry of microorganisms

- Corneal layer
- Hair follicle-sebaceous gland
- Sweat gland





Cross -section of Hair



Cuticle
Cortex
Medulla
Cuticle Scales

Hair Shaft or Stem
that part of the hair
that extends wholly
above the skin

**Epidermis / Outer
Layer** of the skin.
Cuticle or Scarf Skin

Root, that part of the
hair that lies within the
follicle.

Hair Follicle tube-
like inversion of the
skin through which
the hair reaches the
surface of the skin.

**Sebaceous or
Oil Gland**

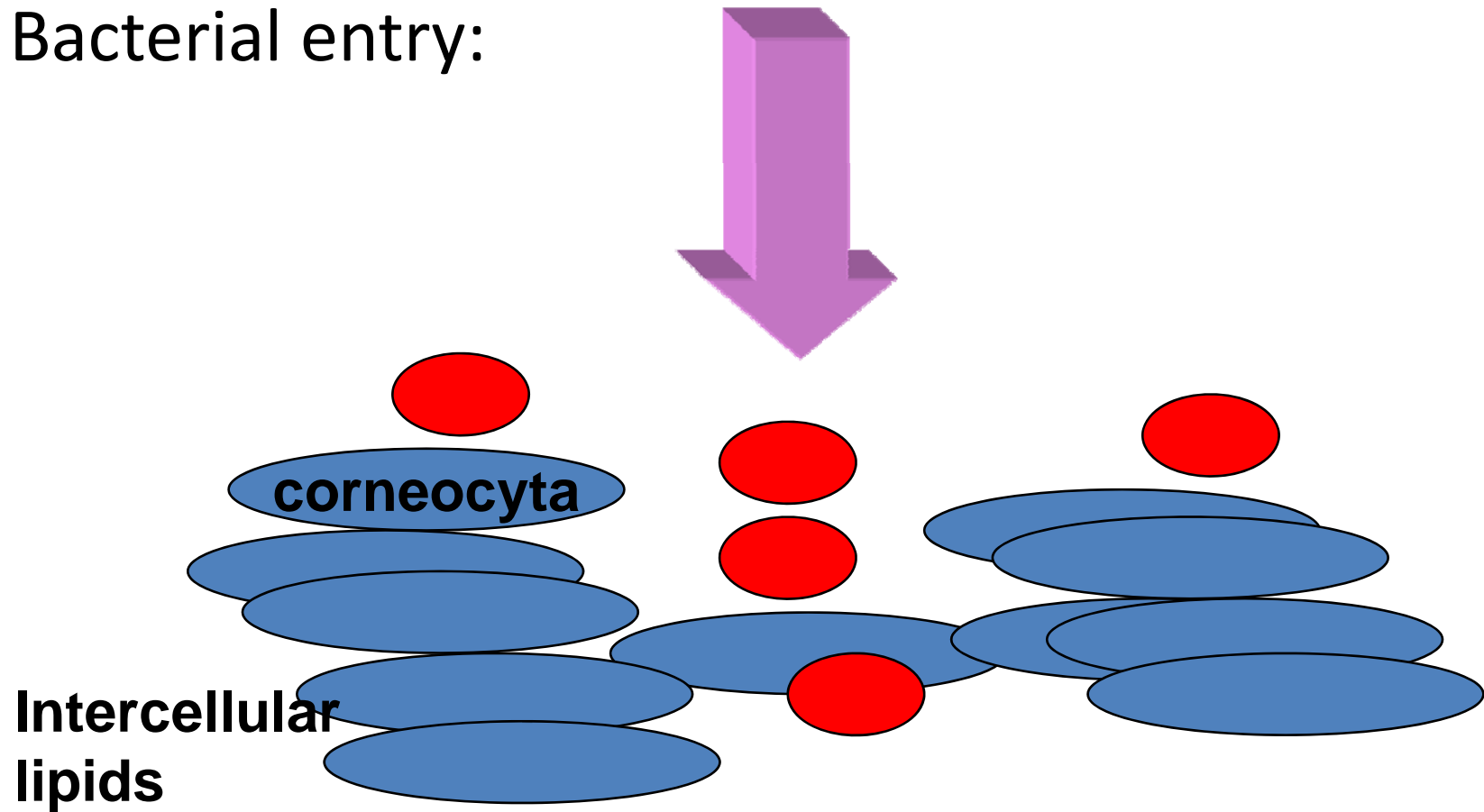
Arrector Muscle

Bulb

Papilla

STRATUM CORNEUM-inproper structure

- Bacterial entry:



Prevention of entry of microorganisms and chemicals

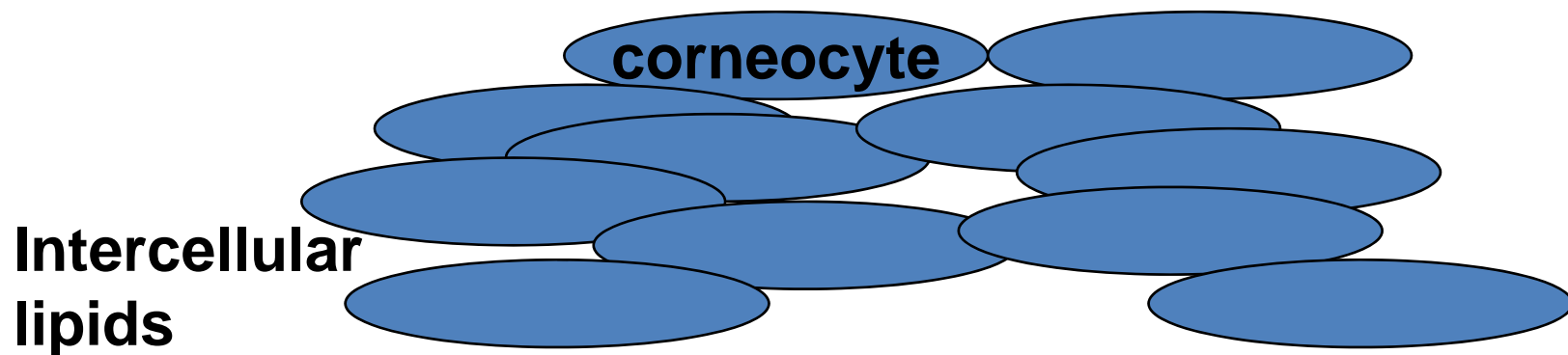
- **Physiochemical characteristics of the epidermis:**
 - Dryness**
 - Acid pH**
- **lipid layer**
- **integrity, proper structure of the epidermis (barrier)**
- **normal bacterial flora**

Corneal layer

- Constant shedding
- Dry surface
- Resistant barrier

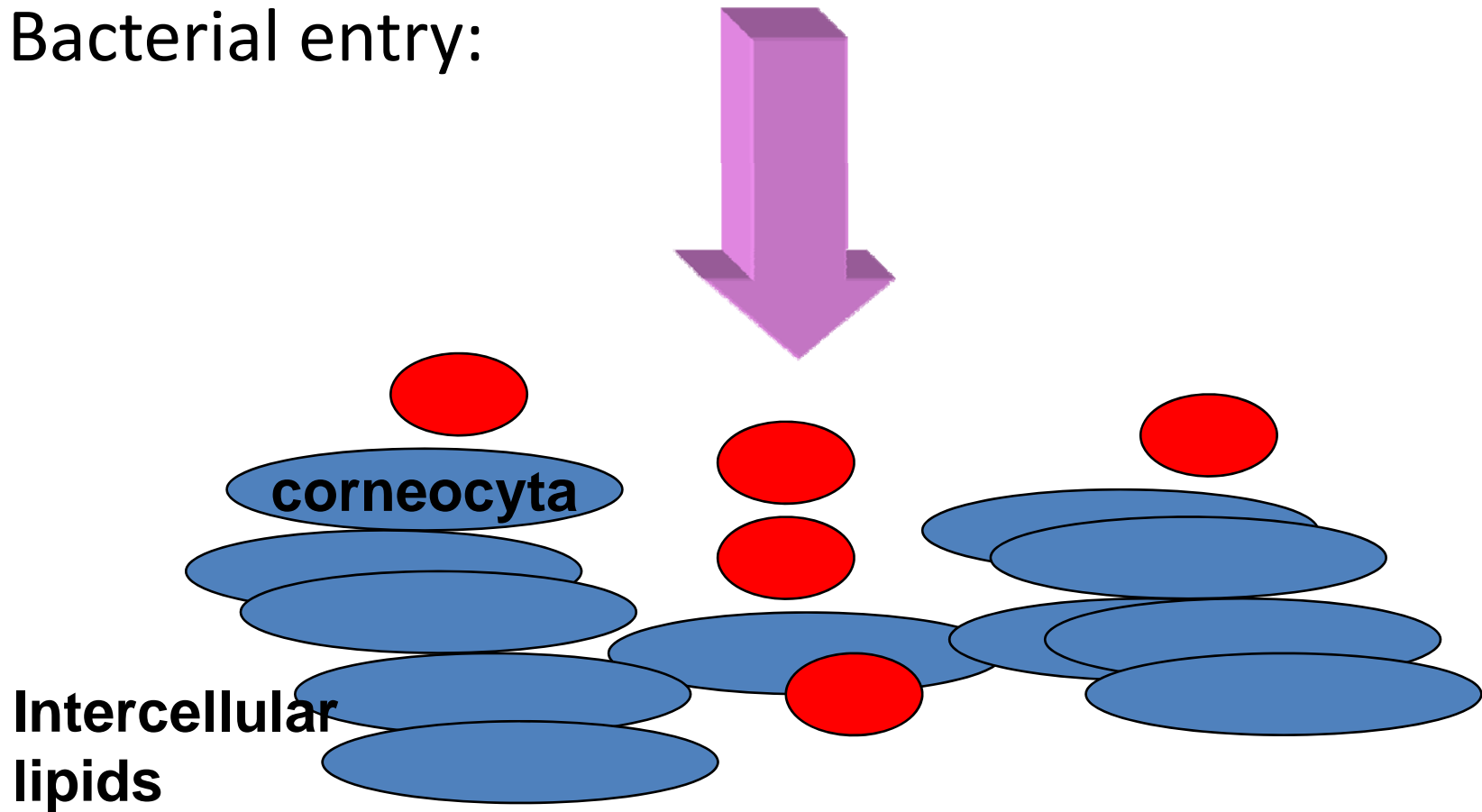
STRATUM CORNEUM

- System of 2 components:
- 1. Cells /corneocytes/
- 2. Embedded in intercellular lipids



STRATUM CORNEUM-inproper structure

- Bacterial entry:



- The skin is a relatively dry environment.
- It also has an acid pH.
- It is thus inhospitable for many microbes.

- FOLLICULITIS: pustular infection of hair follicle
- FURUNCLE: acute abscess in adjacent hair follicles
- CARBUNCLE: deep abscess in a group of follicles

NORMAL SKIN MICROFLORA

- **Gram positive bacteria:**
- **staphylococci**
- **micrococci**
- **corynebacteria**
- **Propionibacteria**
- Most of the microflora of the skin are Gram-positive bacteria such as the coagulase-negative staphylococci

- Anaerobic bacteria can live within the pores of the skin
- *Propionibacterium acnes*: inhabit hair follicle
- It metabolises sebum, releasing free fatty acids. These enhance the anti-microbial environment provided by the skin

Immune system

- Innate: more evolutionarily primitive
- Rapid response to foreign agents by cell receptors and molecules
- Adaptive:
- T and B cells with antigen-specific receptors produce a slower, but more specific and coordinated IR
- Leading to expansion of a memory phenotype

Toll-like receptors (TLRs)

- a class of single membrane-spanning receptors that recognize structurally conserved molecules derived from microbes
- once they have reached physical barriers such as the skin or intestinal tract mucosa activate immune cell responses.

Toll-like receptors (TLRs)

- Following activation by ligands of microbial origin, immune cells can produce [cytokines](#) which trigger [inflammation](#).
- bacterial infection: the pathogen might be [phagocytosed](#) and digested,
- its [antigens](#) presented to [CD4+ T cells](#).
- viral factor:
- the infected cell may undergo programmed cell death ([apoptosis](#)). Immune cells that have detected a virus may also release anti-viral factors such as [interferons](#).

- Imiquimod cardinally used in dermatology
are ligands for TLR7

- Activated TLRs differentially trigger the expression of cytokines such as the interferons; the interleukins; IL-2, IL-6, IL-8, IL-12, IL-16, and TNFalpha.

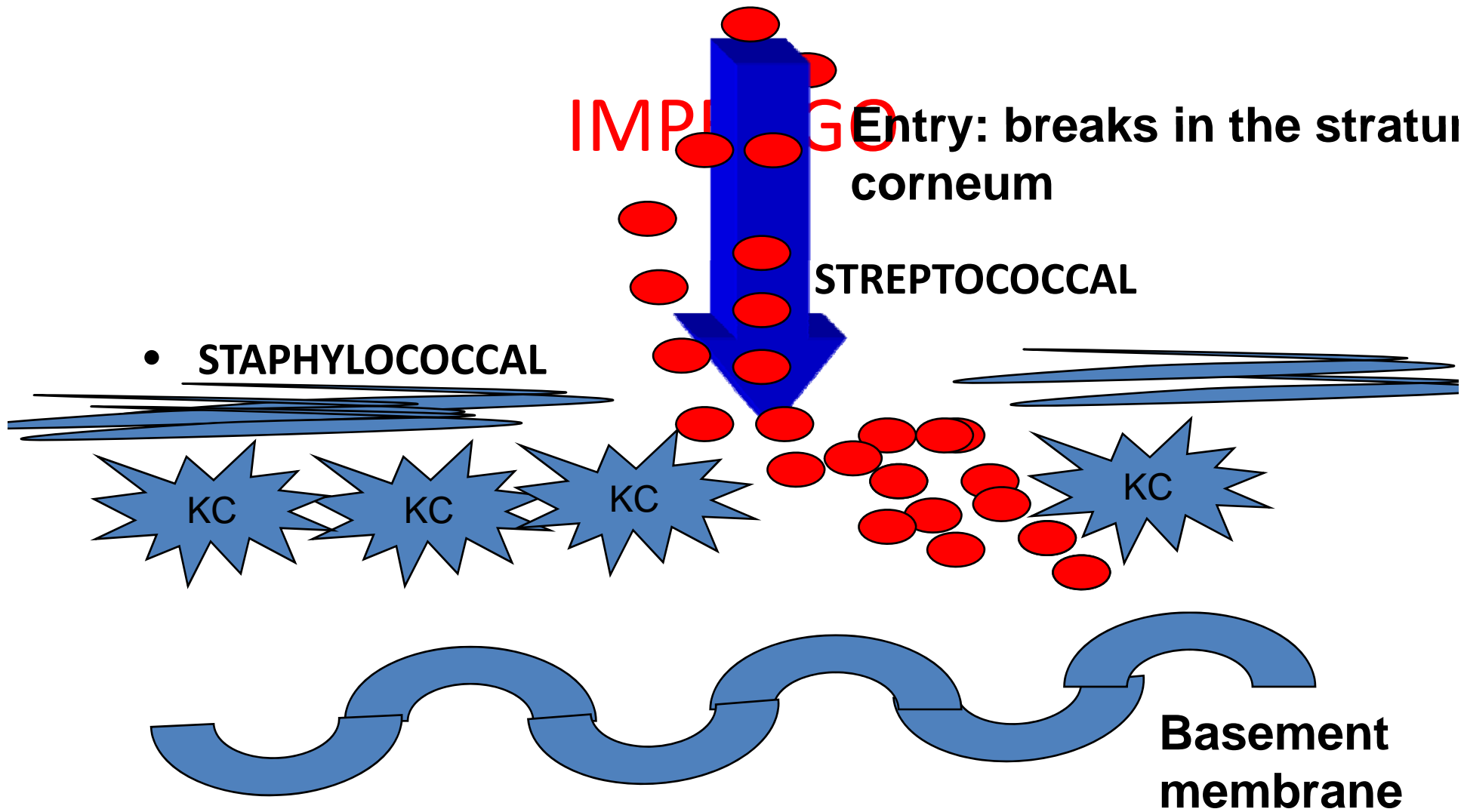
BACTERIAL INFECTIONS

- I.
- II. Bacterial infections:
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- impetigo, folliculitis, furuncle, erysipel, cellulitis, fasciitis necrotisans, SSSS, toxic shock syndrome

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STAPHYLOCOCCAL INFECTIONS (Staph. aureus)

- CARRIER SITES: nose, axilla, perineum
- **PRIMARY INFECTIONS**
- **SECONDARY INFECTIONS**



Desintegration of epidermis, corneal layer

- Break, injury
- Wound, excoriations- (pruritus)
- Dryness (inproper lipid layer)

- Clinical conditions: pruritus, erosion after blister formation, dermatitis, eczema, scabies

IMPETIGO

- **CLINICAL FEATURES.**
- THIN WALLED, EASILY RUPTURED **BLISTERS**
- YELLOW CRUSTED EXUDATE
- **MANAGEMENT:**
- CRUST REMOVAL
- TOPICAL ANTISEPTIC

Impetigo

Impetigo bullosa neonatorum

Treatment

- Local- removal of crust
- Antiseptic lotion, cream
- Antibiotic treatment: only in resistant cases

Secondary infection

- **impetiginization:**
- atopic eczema, scabies, eczema, lice, herpes simplex
- Interdigital erosion (mycosis) (fissures, erosions)

Atopic dermatitis

STAPHYLOCOCCUS INFECTIONS

- ECTHYMA: circumscribed, **ulcerated**, crusted infected lesion
- FOLLICULITIS: pustular infection of **hair follicle**
- FURUNCLE: acute **abscess in adjacent hair follicles**
- CARBUNCLE: **deep abscess** in a group of follicles

Folliculitis

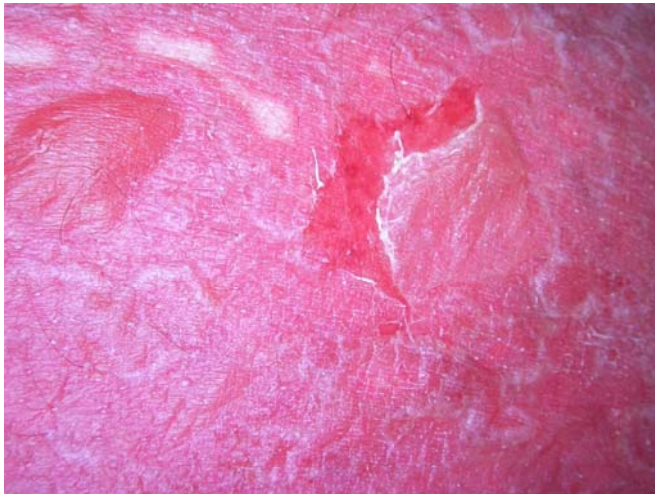
Boil, furuncle

Carbuncle

Staphylococcal scalded skin syndrome (SSSS)

- SSSS:
- Lysis (separation) in the epidermis

- **Staphylococcal scalded skin syndrome**



Differential diagnosis:

- **Toxic epidermal necrolysis -TEN**

TEN

- Severe drug hypersensitivity reaction

Staphylococcal scalded skin syndrome (SSSS)

- **epidermolytic toxin: phage group 2 *Staph. aureus***
- **Infection: in oral or nasal cavities, throat, or the umbilicus**
- **red skin rash and separation of the epidermis beneath the granular cell layer**
- **Bullae form and diffuse sheetlike desquamation occurs**

Toxic shock syndrome

- **Toxic shock syndrome (TSS)** is a rare but potentially fatal disease caused by a [bacterial toxin](#).
- Different [bacterial toxins](#) may cause toxic shock syndrome, depending on the situation.
- [*Staphylococcus aureus*](#) and [*Streptococcus pyogenes*](#)

Diagnosis of TSS

- based on CDC criteria
- :
- Body temperature > 38.9 °C
- Systolic blood pressure < 90 mmHg
- Diffuse rash, intense erythroderma, with subsequent desquamation, especially of the palms and soles

Therapy

- Women wearing a tampon at the onset of symptoms should remove it immediately.
- aggressive IV fluid administration and antistaphylococcal antibiotics, such as cephalosporins, penicillinase-resistant semisynthetic penicillins or vancomycin.

- Streptococcal toxic shock-like syndrome can result from infection of the skin. Antibiotic treatment consists of [penicillin](#) and [clindamycin](#).
- With proper treatment, patients usually recover
- The condition, however, can be fatal within hours.

Streptococcal infections

Impetigo

ERYSIPEL

- DEMARCATED ERYTHEMA, OEDEMA, TENDERNESS
- FEVER, MALAISE, FLU-LIKE SYMTOMS
- RECURRENT ATTACKS: LYMPHOEDEMA

Erysipel

ERYSIPEL

- **DIFFERENTIAL DIAGNOSIS:**
ANGIOEDEMA,
ALLERGIC CONTACT
DERMATITIS
- **MANAGEMENT:**
 - PARENTERAL
PENICILLIN

Erysipelas treatment

- **penicillin** (parenteral, or oral)
- In severe cases: iv. 2- 4 ME, 4, /6 hrs
- Staphylococcus origin: penicillinase-resistant, semisynthetic penicillin or cephalosporin
- **Penicillin hypersensitivity:** clindamycin (450-900 mg iv,/8 hrs), vancomycin (15 mg/kg iv, /12 hrs erythromycin (500 mg, /6 hrs)

Cellulitis

- Streptococcal infection of deeper dermal layers
- Other infectious agents: Staphylococcus, Gram negatives, anaerobs

Cellulitis treatment

- penicillinase resistant penicillin
cefalosporin, fluoroquinolon, amoxicillin-clavulonát, macrolids.
- (cefotoxin, ceftiaxone, cefotetan, cefuroxime, cefotaxime) aminoglikozids, carbapenem (imipenem/cilastatin, meropenem, ertapenem) béta-laktám-béta-laktamase inhibitor)

Fasciitis necrotisans

- Deep streptococcal infection with other infectious agents (anaerobs)
- Severe condition !
- Life-threatening!!!

ACTINOMYCOSIS

- INFECTIVE GRANULOMA
- FORMATION OF NODULES, ENLARGE, BURST DISCHARGING PUS, CONTAINING GRANULES

Aktinomycosis

LUPUS VULGARIS

- **REDDISH-BROWN PLAQUES, APPLE-JELLY COLOUR, SCARRING /HEAD, NECK/**
- **HISTOLOGY:TUBERCULOID GRANULOMA**
- **THER.:ISONIAZID,PYRAZINAMIDE, RIFAMPICIN /6-9 MTHS/**

Lupus vulgaris

SCROFULODERMA

- TUBERCULOUS LYMPH NODE INVOLVES THE OVERLYING SKIN:
- FISTULES, SCARRING

Scrofuloderma

Tbc ulcerosa cutis

Viral infections

Marschalkó Márta

Viral Infections

- Varicella – Herpes zoster
- Herpes simplex
- Kaposi sarcoma-HSV
- Molluscum contagiosum
- HPV (Verruca vulg., condyloma acuminatum)
- Pityriasis rosea

HPV Infection-Warts

- Common benign cutaneous tumors caused by human papilloma virus (HPV)
- usually self-limited
- different clinical presentation
- different HPV types
- some with oncogenic potential
- transmission: direct contact

HPV

- Epidermotropic human papillomavirus (HPV).
- double-stranded papovavirus
- Over 100 types
- neoplastic risk

Common warts

Common warts

Genital warts

HPV

- types 6 and 11 (HPV-6, HPV-11) least neoplastic potential
- HPV types (ie, 33, 35, 39, 40, 43, 45, 51-56, 58) moderate risk for neoplastic conversion
- **HPV-16, HPV-18** high risk neoplastic potential

Genital warts

- Most frequently : penis, vulva, vagina, cervix, perineum, perianal area.
- occasionally : oropharynx, larynx, and trachea
- **Subclinical infections** have an infectious and oncogenic potential.

Genital warts

GENITAL WARTS

- **Cryotherapy**
- **Electrodesiccation**
- **Curettage**
- **Surgical excision**
- **-Carbon dioxide laser treatment**
- **keratolytic agents and antimitotic agents as alternative regimens to cryotherapy**
- **Imiquimod**

Plantar warts

- **hyperkeratotic lesions on the plantar surface- over areas of pressure (heel , ball of the foot)**
- **often endophytic /grow into the deeper layers, due to pressure/**

MOLLUSCUM CONTAGIOSUM

- a common, self-limited, benign viral infection
- pox-virus
- transmitted by close personal contact including sexual contact.

Molluscum contagiosum

- **young children**
- **in adults: the infection occurs with increased frequency in presence of HIV infection**
- **firm papules and nodules with central depressions.**

TREATMENT (MC)

- **Liquid nitrogen cryotherapy**
- **Light electrodesiccation**
- **Removal with curettage, compression or needling followed by touching the base of the lesion with iodine.**
- **Cauterization with trichloroacetic acid, silver nitrate phenol or KOH**

Herpes simplex

- Cutaneous infection due to Herpes virus hominis
- Two types of Herpes virus: Type 1: cold sores in upper lip area,
- Type 2: genital herpes

Herpes simplex

Herpes simplex

- Primary infection: almost universal in childhood, or early adult life, usually subclinical
- Recurrent infection: latency in sensory ganglia

Herpes simplex

Herpes simplex

- **Clinical features:**
- grouped, painful small blisters on erythematous base
- **Pathology:**
- intracellular oedema, balloon degeneration of the infected epidermal cells with intranuclear inclusion

HERPES ZOSTER-SHINGLES

- Aetiology: Herpesvirus varicellae (chickenpox virus)
- disease of adult life, or old age

Herpes zoster

- Prodromal pain in a dermatome distribution, malaise, fever
- Groups of small blisters on linear erythematous base
- special varieties: involvement of ophthalmic division of trigeminal nerve, Ramsay-Hunt syndrome: pain and blistering of external ear

Herpes zoster